SRS Senior Radiologists Section Notes

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Fall 2017

Imaging: 1967 – 2017 and the Impact of Ultrasound

by Christopher R. B. Merritt, MD

Christopher R. B. Merritt

In 1967, a weekly feature for medical school seniors was the "bullpen" in the Charity Hospital amphitheater [Figure 1]. Students were assigned a patient and given 30 minutes do a history and physical exam and then present their differential diagnosis and recommendations to an attending. Diagnosis was almost exclusively based on the history and physical examination. Laboratory studies were generally confined to basic electrolytes, a CBC, urinalysis, sputum stains, and a chest x-ray. This was good preparation for internship and residency on the Osler Medical service at Hopkins. Interns were on call 24 hours a day for 6 days a week and usually spent 16 to 18 hours a day attending patients at the bedside.

On Osler, there were no computers and handwritten or typed paper records hung on a chart rack. The wards were not air-conditioned, and yellow curtains separated each of the 28 beds. There were no patient monitors, IV pumps, or respirators, and interns performed basic lab work on their patients. Nursing care was excellent and house staff and nurses worked as a team caring for the patients [Figure 2]. Lack of technology was compensated for by close and direct interaction with the patients and their families, and the practice of medicine was extremely satisfying and filled with empathy and compassion. The patient, rather than the result of an imaging test, was the object of all of our attention. Defensive medicine was not a concern.

In the late 1960s imaging was limited and played a relatively minor role in diagnosis and management

In the late 1960s imaging was limited and played a relatively minor role in diagnosis and management. The most sophisticated imaging technology was the nuclear medicine scan. In 1968, *Radiology* and the *American Journal of Roentgenology* reflected quite different perspectives on the field of radiology. In *Radiology* 22% of the papers dealt with new technology - nuclear medicine and angiography. In contrast, the *American Journal of Roentgenology*, dealt largely with articles on radiation therapy and nuclear medicine.

Figure 1. Charity Hospital, New Orleans, 1967. Diagnosis was based on history and physical exam. Imaging was limited to radiography and fluoroscopy and played a minor role.

Following my internal medicine residency at Hopkins, I had no interest in diagnostic radiology. I spent the next 3 years in the immunology branch of the National Cancer Institute in Bethesda. Research centered on the new field of bone marrow transplantation and treatment of graft versus host disease. Whole body radiation prepared candidates for

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A Word From the Chair

by
Bruce L. McClennan, MD

The Convergence of Change and Opportunity

Some years ago, I gave a number of talks or lectures in grand rounds-like style and settings with the above-listed title.

Actually the first time was on or about 1995, the 100th anniversary of the discovery of the x-ray, and when I went to Yale as department chair. Certainly, change has been the traveling companion of our specialty these past few decades.

Perhaps overstating the obvious, but with the maturation of our imaging tools – for example, CT, ultrasound, MRI, and IR – have changed the role of the radiologist in the diagnostic process, and in medicine in general. Add the "alphabet soup" of our daily practice the additions of PACS, EHR, voice recognition, RIS, HIS, and teleradiology to the nocturnal practice for a radiologist and we have a mere snapshot of what today is like in the reading room. There are those prognosticators who are predicting what tomorrow will be like with a whole new lexicon – artificial intelligence (AI), machine learning (ML), deep learning (DL), neural networks, to name a few.

It is hard not to read, in the summer heat and humidity in Chicago, about the future, specifically self-driving or driverless automobiles. Does the future augur for radiologist-less hospitals? Of great interest to me, even some alarm, is the computer scientist Geoffrey Hinton, who in essence said we should STOP training radiologists right now. He used the analogy of Wile E. Coyote having run over the cliff but yet to actually look down.

Will AI, including DL and ML, change what radiologists do in the future? The easy answer is yes, for sure. It will change how radiology is practiced, but I doubt it will eliminate the radiologist, just like the self-driving car has yet to eliminate the human driver – in fact its performance is improved with a human on board.

The perspective of many of us, not retired or in part-time practice, allows us to appreciate the advancements and promises to and for our field, but in some ways we actually have the best perspective.

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Chair *continued from page 1*

We lived through the introduction of CT and MRI and ultrasound, so what is it to us to integrate another technology?

We have asked the question before "is the technology leading the science?" or vice versa? I am sure many of our SRS members can remember that NMR was parenthetically said to actually mean "No More Radiology."

The N for nuclear, was taken off the table so to speak, and I for imaging was added – thus MRI in current parlance.

As I was writing this column the first approval from the FDA was given for gene therapy for childhood leukemia. Precision medicine is here now and not just to project longevity but, like the driverless car craze, rather to improve safety and value in patient care. There have to be analogies to the radiology profession. It's easy to imagine future radiologists, helped along in the diagnostic process by some AI method, which allows them to augment their effectiveness in reaching a correct diagnosis and even the speed at which that is done.

My own recent purchase of a Subaru with adaptive cruise control, lane-keeping signals and assistance, wrap-around cameras, and automatic braking, is the best car I've ever owned, and it surely improved my ability to be its driver. AI will likely move the radiologist from the process of detection to a diagnosis faster and better, rather than replacing a radiologist as a powerful force for patient care.

Hasn't the presence of autopilots on airliners made being a pilot easier and better, not replacing the pilot, whose judgment and skill is still necessary for an optimal flying experience? When reading about machine learning and "big data," it seems easy to predict the future; however, figuring out what exactly to do tomorrow continues to remain a challenge. As you can read, you now know what has been on my summer reading list. I hope your summer has been both challenging and satisfying.

Please remind your friends and colleagues who might be eligible and interested of the benefits and pleasures of being an SRS member.

I hope you enjoy this issue with its photographic memories of our wonderful time in New Orleans and a summary of Dr. Chris Merritt's excellent John Tampas Oration.

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Figure 2. Osler 4. In 1967 handwritten medical records were kept on paper and nursing was focused on the patient rather than administrative tasks.

transplantation, and my experience in dealing with near lethal doses of radiation led me to pursue a career in radiation oncology.

In New Orleans where, as a medical student, I had become close friends with Dr. Charles Nice and his family, I began a general radiology residency at Charity Hospital. General radiology training included both diagnosis and therapy and many radiologists of that era practiced both. Therapy centered on the use of cobalt 60 and radium, and diagnostic imaging consisted largely of radiography and fluoroscopy. Although early image intensifiers were available at some outlying hospitals, we still required red goggles to dark adapt prior to conventional screen fluoroscopy.

I completed my residency in 1975 and joined the staff of the Ochsner Clinic in New Orleans, practicing a combination of radiation therapy and general radiography and fluoroscopy. Imaging was film based, with studies hung on multipanel viewboxes for interpretation and a hot light for image processing. Cases were dictated directly to a tran-

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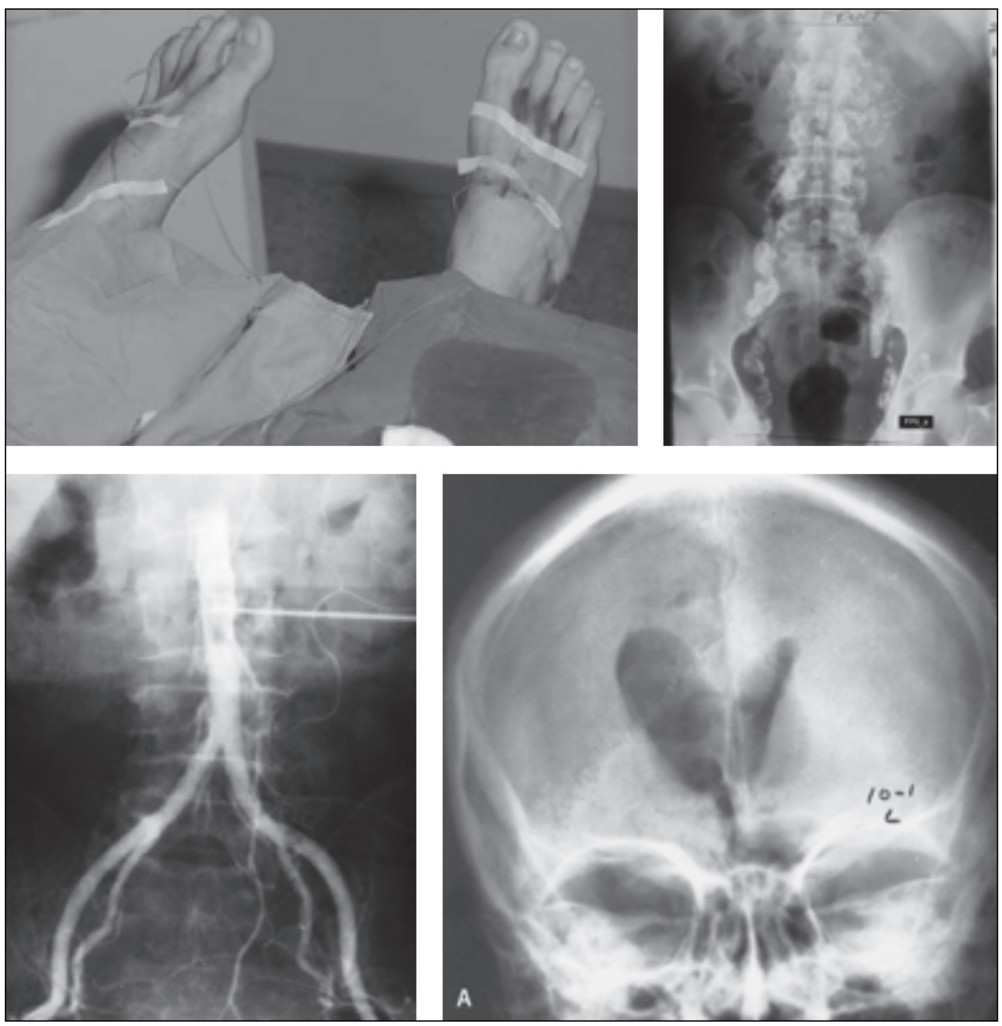

Figure 3. The early 1970s. Specialized imaging included now obsolete exams including lymphangiography, direct aortic angiography, and pneumoencephalography.

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scriptionist in a cubicle next to the reading room and were typed and signed in real time. The daily workload included 40 to 50 barium studies along with numerous oral cholecystograms, intravenous urograms, and chest and bone radiographs. Specialized imaging consisted of polytomography, pneumoencephalography, lymphangiography, and angiography [Figure 3]. Evaluation of the aorta, runoff vessels and carotid vessels was performed by direct puncture. Women's imaging consisted of xeromammograms, hysterosalpingography, and pelvimetry [Figure 4]. Image-guided intervention was nonexistent.

In 1975 ultrasound was in its early clinical development and I acquired a machine and placed it in the radiation therapy department and began scanning patients from the nearby emergency department [Figure 5]. At that time there were no other sectional imaging modalities and a large part of the challenge of ultrasound was learning anatomy in a completely new way. As a result the groundwork in understanding sectional anatomy came from ultrasound. Ultrasound, unlike CT and MRI, permitted imaging not only in standardized axial planes but allowed scan planes in virtually any orientation, requiring a very detailed knowledge of anatomy.

In 1976 upon the retirement of Dr. Seymour Ochsner, I became chair of the department at Ochsner. This provided an opportunity to reequip the department at a time that the entire field of imaging was undergoing immense change. With ultrasound new findings were being reported regularly, and the overall quality of ultrasound images often exceeded those of early body CT scans [Figure 6].

The development of Doppler ultrasound in the late 1970s further expanded the applications of ultrasound, although prior to the introduction of color Doppler, this was mainly of interest to vascular surgeons and diagnosis was based on waveform analysis rather than imaging [Figure 7].

An important technological development at the end of the 1970s was real-time ultrasound, leading to the rapid development of new ap-

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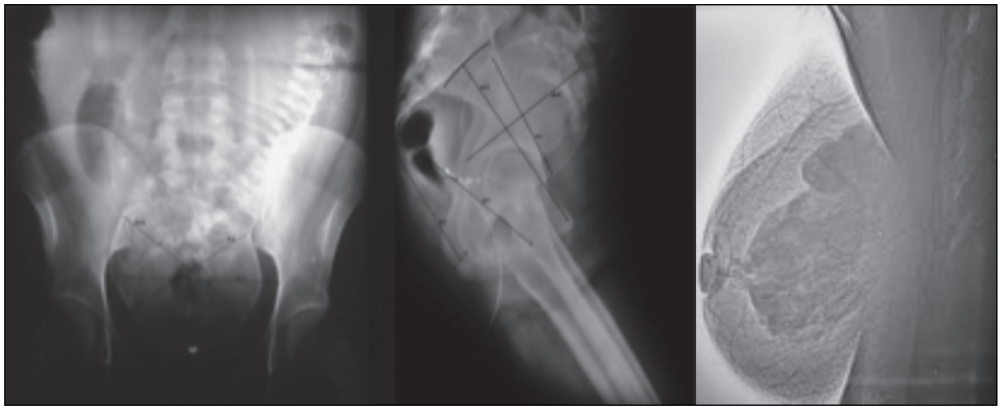


Figure 4. Women's imaging 1970. Specialized women's imaging in the 70s and early 80s included pelvimetry and xeromammography. Ultrasound was soon to have a major impact on the evaluation of the uterus and ovaries, the fetus, and the female breast.

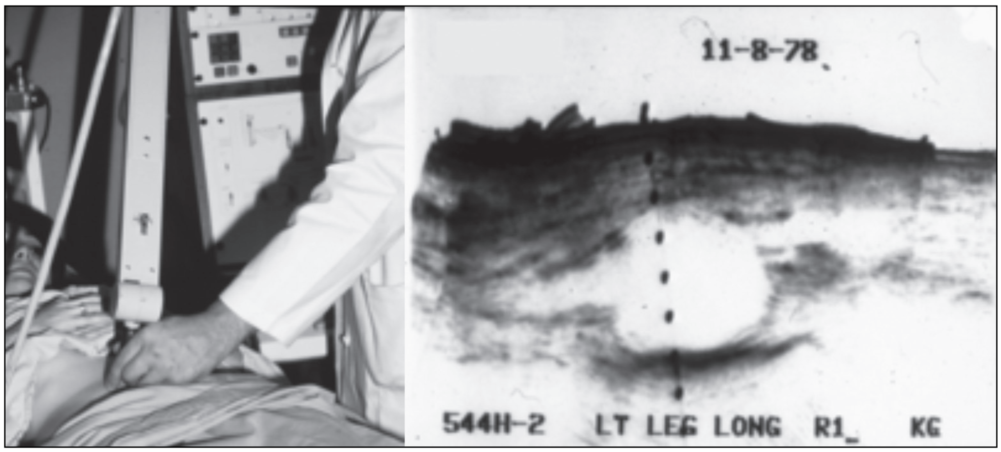


Figure 5. Ultrasound 1978. Articulated arm B-scanner and sagittal image of a large popliteal artery aneurysm. Images were created by manually moving the transducer in a series of arcs over the body until a complete 2-dimensional image was stored on the scan converter. Polaroid pictures of the screen made permanent records. The transducer was coupled to the skin with mineral oil. Some time later, and after much debate, white images on a black background were established as the standard.

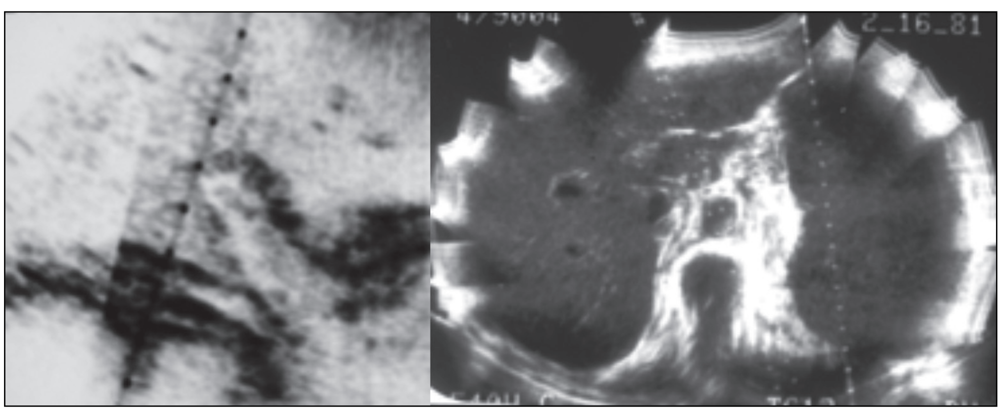
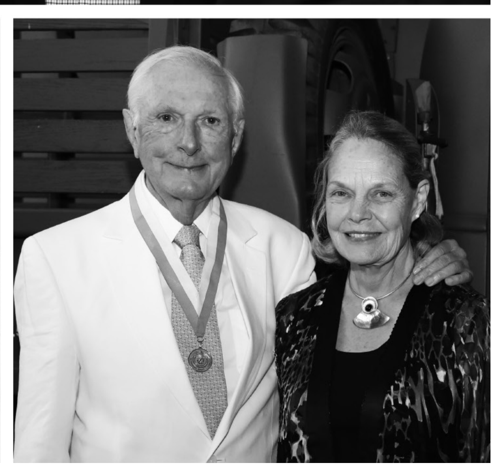


Figure 6. Ultrasound in the late 70s. Ultrasound regularly revealed previously unseen pathology such as portal vein thrombosis (left). In the early 80s ultrasound images often were more revealing the than the body CT images of the time.

Upcoming ARRS Annual Meetings

April 22–27, 2018	May 5–10, 2019	May 3–8, 2020	April 18–23, 2021
Marriott Wardman Park Hotel (DC)	Honolulu Convention Center	Sheraton Grand Chicago	Marriott Marquis San Diego Marina

ANNUAL MEETING
ARRS
New Orleans
April 30–May 5, 2017



Obituaries

Robert N. Berk, MD, 87, passed away in September. He was a former editor of the *American Journal of Roentgenology* and was awarded the ARRS Gold Medal in 1996. Dr. Berk served as UCSD's second chair of Radiology from 1977 to 1985. Berk received numerous accolades and honors throughout his career, including the Walter B. Cannon Medal, given by the Society of Gastrointestinal Radiology for "outstanding contributions to GI Radiology" in 1984. He served as president of the Society of Gastrointestinal Radiology and played key roles in several other radiological organizations. By the end of his career, Dr. Berk had published 116 papers, 22 chapters, and three books, and had delivered lectures in many countries. He is survived by his children Daniel, Perry and Ellen; his grandchildren Adam, Aaron, Tammy, Michael, Emily, and Blythe; and his beloved wife Sondra Reidbord Berk, whom he celebrated in his memoir, "My Life with Sondra and My Career in Radiology: 1955–1995, A Memoir with Special Memorabilia."

A. Everette James Jr., M.D., J.D., passed away earlier this year. He was 78. James was a past president of the American Roentgen Ray Society and was awarded the ARRS Gold Medal in 2003. James was the chair of Vanderbilt University's Department of Radiology and Radiological Sciences from 1975 to 1991. He was a Scholar of the Institute of Medicine, a Visiting Scientist at the National Cancer Institute/National Institutes of Health in 1991–92 and Senior Program Officer of the National Academy of Sciences in 1993–94, all in Washington, DC. In 1994–95 he served the Special Advisor to the Governor of North Carolina and Board of Science and Technology. For more than 20 years he served as a consultant to the Smithsonian's National Zoo and as a member of the National Council of Radiation Protection. A Vietnam veteran and an avid art collector, James was the author of more than 540 articles, 200 book chapters, and more than 20 books on medicine, law, ethics, art, folklore, and fictional works. He is survived by his wife, Nancy Jane Farmer; son Everette James III, wife Gretchen and grandchildren Katie and Charlotte; daughter Jeannette James Whitson, husband Clay Whitson Sr., and grandchildren Clay Jr. and Elizabeth.

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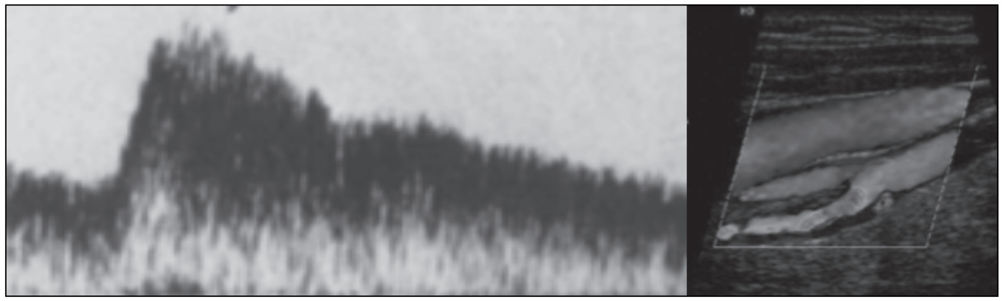

Figure 7. Doppler ultrasound. Doppler spectral analysis, when introduced in the 70s, was largely performed by vascular surgeons. The development of color Doppler in 1983 introduced many radiologists to Doppler, now an integral part of the ultrasound exam.

plications in obstetrical, abdominal, pediatric, and intraoperative imaging [Figure 8].

Developments in computers in the early 1980s led to an opportunity to participate in the development of two exciting new technologies. The first, unrelated to ultrasound, involved the use of photostimulable phosphors for image capture and conversion to digital radiographs. Through a collaboration with the Philips medical systems one of two existing computed radiographic imaging prototypes in the world were installed in the Ochsner radiology department under tight security and after 3 years of development the results of our work were published. By the end of the 1980s digital images from this system were being transmitted and displayed on computer monitors in the intensive care units at Ochsner. Today filmless digital radiography based on this technology is standard in almost all radiology departments in North America and Europe, although wide adoption occurred 20 years after commercial units became available.

The second breakthrough in technology involved ultrasound and provided a method to image Doppler information. Working with a small company in Seattle and a large prototype device, we generated the first images of blood flow in the abdomen and peripheral vessels using color Doppler [Figure 9]. Color Doppler, by allowing Doppler information be shown in an image rather than as a waveform, was important in getting radiologists interested in Doppler. Today color Doppler is an integral part of the ultrasound examination.

A less successful application of ultrasound in the 1980s was in the evaluation of

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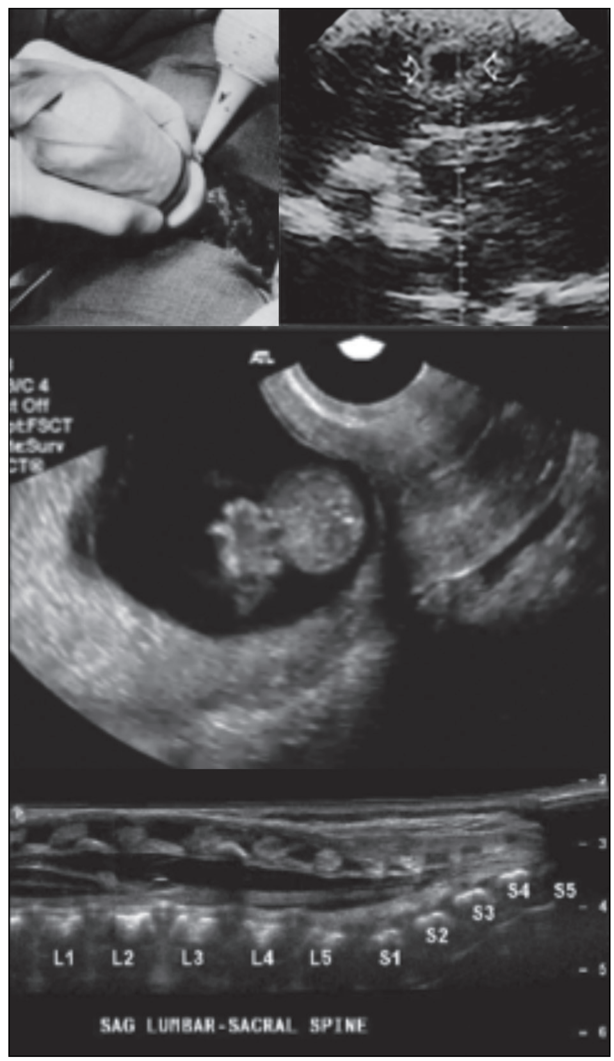

Figure 8. Real-time ultrasound. Specialized transducers for intraoperative, transvaginal, and high-resolution breast, small parts, and pediatric imaging followed the development of real-time ultrasound in the late 70s. These applications remain a unique strength of ultrasound. (Top – intraoperative scan of brain abscess. Middle – transvaginal scan of gastroschisis in 14 week fetus. Lower – sagittal scan of newborn spine with cyst of filum terminiale.)

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Figure 9. Imaging breakthroughs. In the early 1980s both color Doppler and computed radiographic imaging were developed in the Ochsner radiology department using prototype devices with industry support. These recolutionary technologies lead to reports featured on the covers of *Diagnostis Imaging* in January 1985 and November 1986.

the breast. Early breast scanners produced quality images by scanning the breast, as the patient lay prone in a water tank. Unfortunately, breast ultrasound was promoted aggressively by many manufacturers and by the mid 1980s was discredited as a useful addition to mammography. By the mid

A radiologist of 50 years ago would not recognize the field if he or she were to return today.

1990s however, advances in breast ultrasound demonstrated an important role in the evaluation of breast masses, making ultrasound an indispensable part of breast imaging and leading to the BI-RADS breast imaging and reporting system for ultrasound.

Ultrasound also has had a major impact in providing guidance for minimally invasive diagnostic procedures. Fine needle biopsy of lesions of the liver, kidney, retroperitoneum, as well as peripheral lymph nodes and the thyroid have become a standard part of the diagnostic workup [Figure 10].

A radiologist of 50 years ago would not recognize the field if he or she were to return today. In less than 50 years the computer has changed the practice of medicine. More precise and early diagnosis are clear benefits of the technology of the 21st century, but they are accompanied by the perils of overutilization prompted by defensive medicine with interests of the physician potentially overshadowing those of the patient. Although the contribution of these advances has benefited countless patients, many of the rewards of the practice of medicine have been diminished. In looking back at my 50 years of practice of medicine, recalling my final grand rounds at Charity Hospital, I appreciate the diagnostic skills acquired through history and physical examination, as well as the relationship I had with my patients during my clinical years. To me this represents the real definition of being a physician. In many cases, these simple tools were often as effective and certainly more satisfying than today's tendency to view the patient as the result of an imaging test rather than a person.

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Figure 10. Biopsy guidance. Ultrasound guided biopsy of a one centimeter hepatic mass. Performed under local anesthesia the procedure offers low risk, high efficacy and minimal patient discomfort.

SRS Birthdays

We wish these SRS members a very happy birthday.

October

4 James R. Custer
6 Charles F. Greer
8 Eric J. Udoff
9 Melvin L. Turner
12 Robert E. Campbell
James E. Reinhardt
16 Hernani S. Tansuche
22 David C. Levin
25 Ellen L. Wolf
29 Sarah G. Pope
Tie S. Ong
31 Claremont F. Carter

November

4 Paul M. Chickos, Jr.
Stephen N. Fisher
14 Homer L. Twigg, Jr.
17 Mark M. Mishkin
20 Carlos Muhletaler
26 Anton Hasso
28 Jon D. Shanser

December

5 Harry J. Barr
Ian L. Love
6 Stephen F. Albert
9 Terrance C. Demos
10 Frank T. Daly, Jr.
15 Joe F. Franklin
17 Charles Walter Snyder
18 Pamela Van Tassel
26 Herbert F. Gramm
29 Barbara L. Carter
31 Howard P Rothenberg

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The ARRS has a special interest group specifically for senior radiologists. “The Senior Radiologists Section (SRS) provides an opportunity and a forum for senior members of the ARRS to be kept informed on the new developments in radiology as well as enjoy the camaraderie of their colleagues,” says John Tampas, former chair of the SRS.

Benefits include:
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- Annual Meeting reception
- SRS Annual Meeting activities (includes sponsored speaker and special tours)

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- Be a current ARRS member age 65 or older

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If you have not renewed your SRS membership, please contact Sara Leu at sleu@arrs.org or 866-940-2777 to renew today!

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